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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/362,808 | 07/28/1999 | HONGYONG ZHANG | 07977/088002 | 7320 |

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FISH & RICHARDSON P.C.
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER

RAO, SHRINIVAS H

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2814

DATE MAILED: 05/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-----------------|-----------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 09/362,808 | ZHANG, HONGYONG | |
| | Examiner | Art Unit | |
| | Steven H. Rao | 2814 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 1-13, 33 and 34 is/are allowed.
- 6) ☐ Claim(s) 14-32 and 35-40 and 41-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

Applicants' amendment filed on Feb. 17, 2006 has been entered and forwarded to the examiner on Feb. 23, 2006.

Therefore claims 1-40 as recited previously (Therefore claims 1, 6, 10, 14, 16-19, 21, 24-26, 28, 39-40 as amended by the amendment of October 31, 2002 and claims 2-5, 7-9, 11-13, 15, 20, 22-23, 27, 29-39 as previously recited and presently newly added claims 44-49 are currently pending in the Application).

Claims 1-13 and 33-34 were indicated as being allowable in the previous Office Action.

Claims 14-32 and 35-40 and 44-49 are rejected.

Information Disclosure Statement

The IDS filed on February 17, 2006 has been considered and the PTO-1449 initialed and made of record in the file. The contract staff has been instructed to include a copy of the initialed PTO-1449 along with the instant Office Action.

Allowable Subject Matter

Claims 1, 6, 10 (independent) and claims 2-5, 7-9, 11-13 depending therefrom are allowed. The following is an examiner's statement of reasons for allowance:

The prior art taken either singularly or in combination fails to anticipate or fairly suggest the limitation of the dependent claims, in such manner that a rejection under 35 U.S.C. 102 or 103 would be proper. The prior art fails to teach a combination of all the claimed features as presented in independent claims, which include a semiconductor device as recited in the independent claims generally and specifically 1, 6 and 10 a third opening

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in said second interlayer insulating film for exposing said portion of said semiconductor layer, said portion of said gate insulating film and a portion of said first interlayer insulating film which surrounds the second opening and wherein the edges of at least the third opening are rounded off .

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claim Rejections - 35 USC Section 1 03

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action.

(a) a patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made .

Claims 14 -18, 19-30 and 35-37 4]- 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over : Fu et al. in view of Sasaki as applied to claims 1 ,3 and 5 previously, and further in view of Lin et al. (U.S patent # 5,841 ,195).

Fu et al. in view of Sasaki show most aspects of the instant invention (in paragraph 2), including an gate electrode 30 formed over the insulating film and on a

first interlayer insulating film and a second interlayer insulating film over said insulating film and the gate electrode at one contact hole in said first and second interlayer insulating film the first, second and third opening and connected with one of the source and drain regions through the first, second and third openings (see figure 6). Fu et al. in view of Sasaki do not disclose a tapered angle B of the second interlayer insulating film 21 (called 0) with respect to a major surface the semiconductor layer 10 in the third opening is larger than a tapered angle of the first interlayer insulating film 20 (called a) with respect to a major surface of the semiconductor layer ID layer 20.

However, Lin, a patent from the same filed of endeavor describes in figures 6-7 etc. and col. Col. 3 lines 20-25 and 40-65 describe a tapered angle B of the second interlayer insulating film 16/18 with respect to a major surface the semiconductor layer 10 in the third opening is larger than a tapered angle of the first interlayer insulating film 20/22 (called a) with respect to a major surface of the semiconductor. In view of Lin et al. including in figures 6-7 etc. and col. Col. 3 lines 20-25 and 40-65 describe a tapered angle B of the second interlayer insulating film 16/18 with respect to a major surface the semiconductor layer 10 in the third opening is larger than a tapered angle of the first interlayer insulating film 20/22 (called a) with respect to a major surface of the semiconductor, where it is taught that the higher etching rate of an insulating film will produce an angle larger than the angle of another insulating film that has lower etching rate. These angles are the tilt angles of the cross-section a semiconductor device to form contact vias in a semiconductor device by a method performed at low to medium

Claims 44 and 47 (metal -Fu col. 1 lines 20-25 and glass substrate- Fu col. 1

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line 19) are rejected for reasons set out under claims 14, 19 etc.

Claims 45-46 and 48-49 are rejected for reasons set out under claims 7-8, 11-12 etc.

Claims are rejected under 35 U.S.C. 103(a) as being 22,23, 29 and 30 unpatentable over Fu et al. in view of Sasaki and Lin et al. as applied to claims 2, 6-18 previously .,

Fu et al. in view of Sasaki and Lin et al. show most the aspects of the instant invention (paragraph 4 a channel region(Sasaki fig.2c region between 15 and 16), a low doped impurity region(Sasaki fig. 2c regions 15, 16) and high doped impurity region being adjacent to the channel region(Sasaki fig. 2e 15' and 16') with the low doped impurity region interposed between. (Sasaki fig. 2e 15/16 between 15'/16' and channel).

In claims 22,23,29 and 30, the dosage of dope used is an intermediate process step and does not affect the final device structure. (see also Sasaki) .

Claims 38-40 recite the same limitation stated above namely, " the thickness of the first interlayer insulating film is less than one-third of the total thickness of the first and second Interlayer insulating films." (see Zhang's description stated above).

Response to Arguments

Applicant's arguments with respect to claims 1 to 40 have been considered but are not persuasive for reasons set out under the rejections above.

Applicants' contention that the applied Fu, Sasaki and Lin references individually or in combination do not describe or suggest "first and second interlayer insulating films

including a contact hole formed such that a taper angle 'Beta ' of an inner surface of the second interlayer insulating film in the contact hole with respect to a major surface 'of the semiconductor layer is larger than a taper angle α of an inner surface of the first interlayer insulating film in the contact hole with respect to the major surface of the semiconductor layer, as recited in claim 14 is not persuasive because Applicants' contention that the previous explanation "that Lin's layers 20/22 which have smaller taper angle are formed on Lin's layers 16/18 which have a larger taper angle" is not persuasive because Applicants' arguments are not commensurate in scope with presently recited claims. The presently recited claims (e.g 14) only recite taper angle as being smaller with respect to the second interlevel dielectric layer.

It can be clearly seen that layers 16/18 and 20/22 have first and second interlayer insulating films including a contact hole formed such that a taper angle 'Beta ' of an inner surface of the second interlayer insulating film in the contact hole with respect to a major surface of the semiconductor layer is larger than a taper angle α of an inner surface of the first interlayer insulating film in the contact hole with respect to the major surface of the semiconductor layer. (see below).

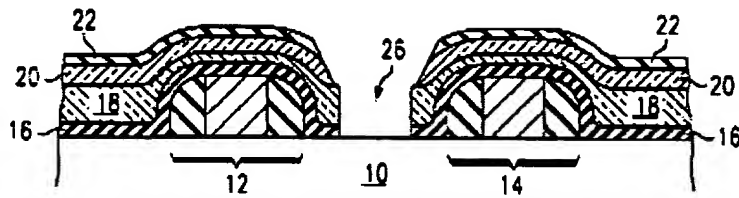


FIG. 6

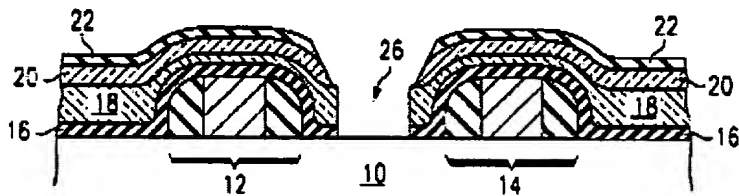
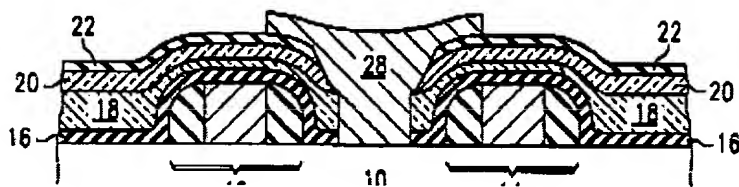
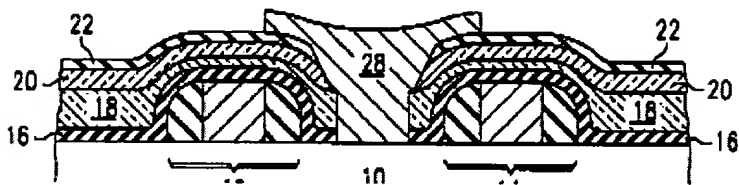


FIG. 6



As seen above, clearly, when two sets of interlayer dielectric are taken together (to equate) the presently recited requirements of claim 14 the set 16/18 or 20/22 each taken individually renders the presently recited claim 14 obvious.

Applicants' attempt to include all four inter layers and conclude they are not smaller is a red herring and not commensurate in scope with the presently recited claims.

Further' Applicants' are directed to Lin col. 2 lines 22-26,col. 3 lines 20-25 and 40

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to 65. All of which make it clear that comparison must be made either layers 16/18 and applicants' claims or layers 20/22 and applicants' claims, and when the correct comparison is made (as opposed to Applicants' comparing Appeals and Oranges by comparing Lin's four layers together 16/18 and 20/22) applicants' arguments are not persuasive.

Therefore Claim 14 and its dependent claims 17-18 are finally rejected.

Applicants' contention w.r.t claim 44 and 47 that the prior art (Lin) does not disclose/teach "a first insulating film and a second insulating film over the first insulting film, with a first taper angle of the first insulating film in a first opening being smaller than a second taper angle of the second insulating film in a second opening" is not persuasive for reasons set out under claim 14 and incorporated here by reference.

Applicants' arguments with respect to claim 19-30 and 35-37 are moot because as shown above the applied Sasaki reference also teaches the limitations that were taught by Huang and therefore even without Huang reference, the previously applied Sasaki is sufficient to reject these claims.

Therefore all claims are Finally rejected.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

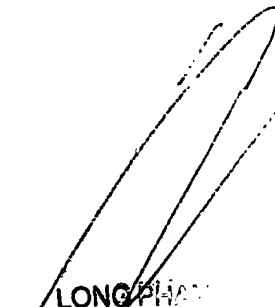
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (571) 272-1718. The examiner can normally be reached on Mondays to Fridays 8.00 to 5.00. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

*See
Cefu 1/19/2006*


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